SCANNING IN WIRELESS NETWORK

FIELD

[0001] The invention relates to the field of wireless communications and, particularly, to network discovery in a wireless communication system.

BACKGROUND

[0002] A terminal device of a wireless communication system may be configured to scan for available communication channels before initiating a link setup with an access point or another terminal device of a wireless network. The scanning may comprise passive scanning in which the terminal device scans for broadcast messages or active scanning in which the terminal device transmits a scanning request message and receives a response to the scanning request message.

BRIEF DESCRIPTION

[0003] The invention is defined by appended independent claims.

[0004] Embodiments of the invention are defined in dependent claims.

LIST OF DRAWINGS

[0005] Embodiments of the present invention are described below, by way of example only, with reference to the accompanying drawings, in which

[0006] FIG. **1** illustrates an example of a wireless communication scenario to which embodiments of the invention may be applied;

[0007] FIG. **2** illustrates a signalling diagram of a scanning process according to an embodiment of the invention;

[0008] FIG. **3** illustrates the effect of an embodiment of FIG. **2**;

[0009] FIG. **4** illustrates a process for mapping the transmission power to carrier sensing threshold(s) according to an embodiment of the invention;

[0010] FIGS. **5**A, **5**B, and **5**C illustrate ranging effect of some embodiments of the invention; and

[0011] FIGS. **6** and **7** illustrate block diagrams of apparatuses according to some embodiments of the invention.

DESCRIPTION OF EMBODIMENTS

[0012] The following embodiments are examples. Although the specification may refer to "an", "one", or "some" embodiment(s) in several locations, this does not necessarily mean that each such reference is referring to the same embodiment(s), or that the feature only applies to a single embodiment. Single features of different embodiments may also be combined to provide other embodiments. Furthermore, words "comprising" and "including" should be understood as not limiting the described embodiments to consist of only those features that have been mentioned and such embodiments may contain also features/structures that have not been specifically mentioned.

[0013] A general wireless communication scenario to which embodiments of the invention may be applied is illustrated in FIG. **1**. FIG. **1** illustrates wireless communication devices comprising a plurality of access points (AP) **100**, **102**, **104** and a plurality of wireless terminal devices (STA) **110**, **112**, **114**. Each base station may be associated with a basic service set (BSS) which is a basic building block of an IEEE 802.11 wireless local area network (WLAN). The most common BSS type is an infrastructure BSS that includes a single AP together with all STAs associated with the AP. The AP may be a fixed AP or it may be a mobile AP. The APs **100** to **104** may also provide access to other networks, e.g. the Internet. In another embodiment, the BSS may comprise a plurality of APs to form an extended service set (ESS). While embodiments of the invention are described in the context of the above-described topologies of IEEE 802.11 and, particularly, IEEE 802.11ac and IEEE 802.11ai, it should be appreciated that these or other embodiments of the invention may be applicable to networks based on other specifications, e.g. other versions of the IEEE 802.11, WiMAX (Worldwide Interoperability for Microwave Access), UMTS LTE (Long-term Evolution for Universal Mobile Telecommunication System), and other networks having cognitive radio features, e.g. transmission medium sensing features and adaptiveness to coexist with radio access networks based on different specifications and/or standards. Some embodiments may be applicable to networks having features under development by IEEE 802.19 task group 1 (TG1).

[0014] IEEE 802.11n specification specifies a data transmission mode that includes 20 megahertz (MHz) wide primary and secondary channels. The primary channel is used in all data transmissions with clients supporting only the 20 MHz mode and with clients supporting higher bandwidths. A further definition in 802.11n is that the primary and secondary channels are adjacent. The 802.11n specification also defines a mode in which a STA may, in addition to the primary channel, occupy one secondary channel which results in a maximum bandwidth of 40 MHz. IEEE 802.11ac task group extends such an operation model to provide for wider bandwidths by increasing the number of secondary channels from 1 up to 7, thus resulting in bandwidths of 20 MHz, 40 MHz, 80 MHz, and 160 MHz. A 40 MHz transmission band may be formed by two contiguous 20 MHz bands, and an 80 MHz transmission band may be formed by two contiguous 40 MHz bands. However, a 160 MHz band may be formed by two contiguous or non-contiguous 80 MHz bands.

[0015] As mentioned above, the transmission band of a BSS contains the primary channel and zero or more secondary channels. The secondary channels may be used to increase data transfer capacity of a transmission opportunity (TXOP). The secondary channels may be called a secondary channel, a tertiary channel, a quaternary channel, etc. However, let us for the sake of simplicity use the secondary channel as the common term to refer also to the tertiary or quaternary channel, etc. The primary channel may be used for channel contention, and a TXOP may be gained after successful channel contention on the primary channel. Some IEEE 802.11 networks are based on carrier sense multiple access with collision avoidance (CSMA/CA) for channel access. Every device attempting to gain a TXOP is reducing a backoff value while the primary channel is sensed to be idle for a certain time interval, for instance 9 microseconds. When the backoff value reaches zero, the STA gains the TXOP and starts transmission. If another STA gains the TXOP before that, the backoff value computation may be suspended, and the STA continues the backoff computation after the TXOP of the other STA has ended and the primary channel is sensed to be idle. The time duration (the backoff value) may not be decremented during the TXOP of the other STA, but the time duration that already lapsed before the suspension may be maintained, which means that the device now has a higher